

Senior Design 403

Design Capture Requirements

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Introduction:

Our team will create a basic microcontroller using an open source processor core and three or more custom peripherals while learning good design practices and concepts.

Requirements:

- The Team will build from scratch three peripherals for an open source processor core using RTL Examples of the peripherals would be (but not limited to)
 - PWM Module
 - UART/MSSP
 - I2C
 - SMBUS
 - DAC
- Device Requirements
 - Read and write from RAM and Flash on FPGA development board
 - Loads software onto device automatically
 - Have general input/output ports for controlling external devices
 - Run compiled C code from a standard compiler designed for reference controller
 - Run on commercially available FPGA demo board
 - Design test applications to demonstrate device operability
 - Demonstrate stable behavior by executing a program the same way as the reference controller would
- If time permits
 - Interface with LCD screen
 - Layout an actual ASIC
 - Develop a real world application for device

Final Deliverables:

- Source RTL for all core, peripheral and system components
- Test programs/simulations demonstrating system operability
- Documentation on how to use device
- Deliver one functional hardware unit

Objectives:

- During this project the team will work on developing the following skills
 - Developing working RTL code
 - Knowledge of revision control
 - Knowledge of FPGA design and use
 - Understanding of digital communication buses
 - Project management skills
 - Design for test principles